

170628

FLOOD INSURANCE STUDY



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VILLAGE OF FAYETTEVILLE,
ILLINOIS

ST. CLAIR COUNTY

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federal emergency management agency
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PUBLISHED SEPARATELY:

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
VILLAGE OF FAYETTEVILLE,
ST. CLAIR COUNTY, ILLINOIS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Village of Fayetteville, St. Clair County, Illinois, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Village of Fayetteville to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers, St. Louis District, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-18-78, Project Order No. 14. This study was completed in November 1979.

1.3 Coordination

At the request of the Consultation Coordination Officer (CCO), appointed by the Federal Insurance Administrator, the first community meeting was held on December 15, 1977. This meeting, attended by representatives of the Village of Fayetteville, the FIA, the U.S. Army Corps of Engineers (COE), and the Southwestern Illinois Planning Commission, was held to explain the nature and purpose of the Flood Insurance Study.

A public notice announcing the beginning of the study and stating its objectives was placed in the local newspaper. The Illinois Department of Transportation served as the State Coordinating Agency for this study.

During the course of this study, contact was made with the Soil Conservation Service (SCS), the Federal Highway Administration, the Illinois State Water Survey, the Illinois Division of Water Resources, the U.S. Geological Survey (USGS), and the Village of Fayetteville to obtain general community information.

On February 20, 1980, the results of the hydrologic and hydraulic analysis were reviewed at an intermediate CCO meeting attended by representatives of the Village of Fayetteville, the State of Illinois, the Southwestern Illinois Planning Commission, and the COE.

On July 22, 1980, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives from the Village of Fayetteville, the State of Illinois, the Southwestern Illinois Planning Commission, and the COE.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Village of Fayetteville, St. Clair County, Illinois. The area of study is shown on the Vicinity Map (Figure 1).

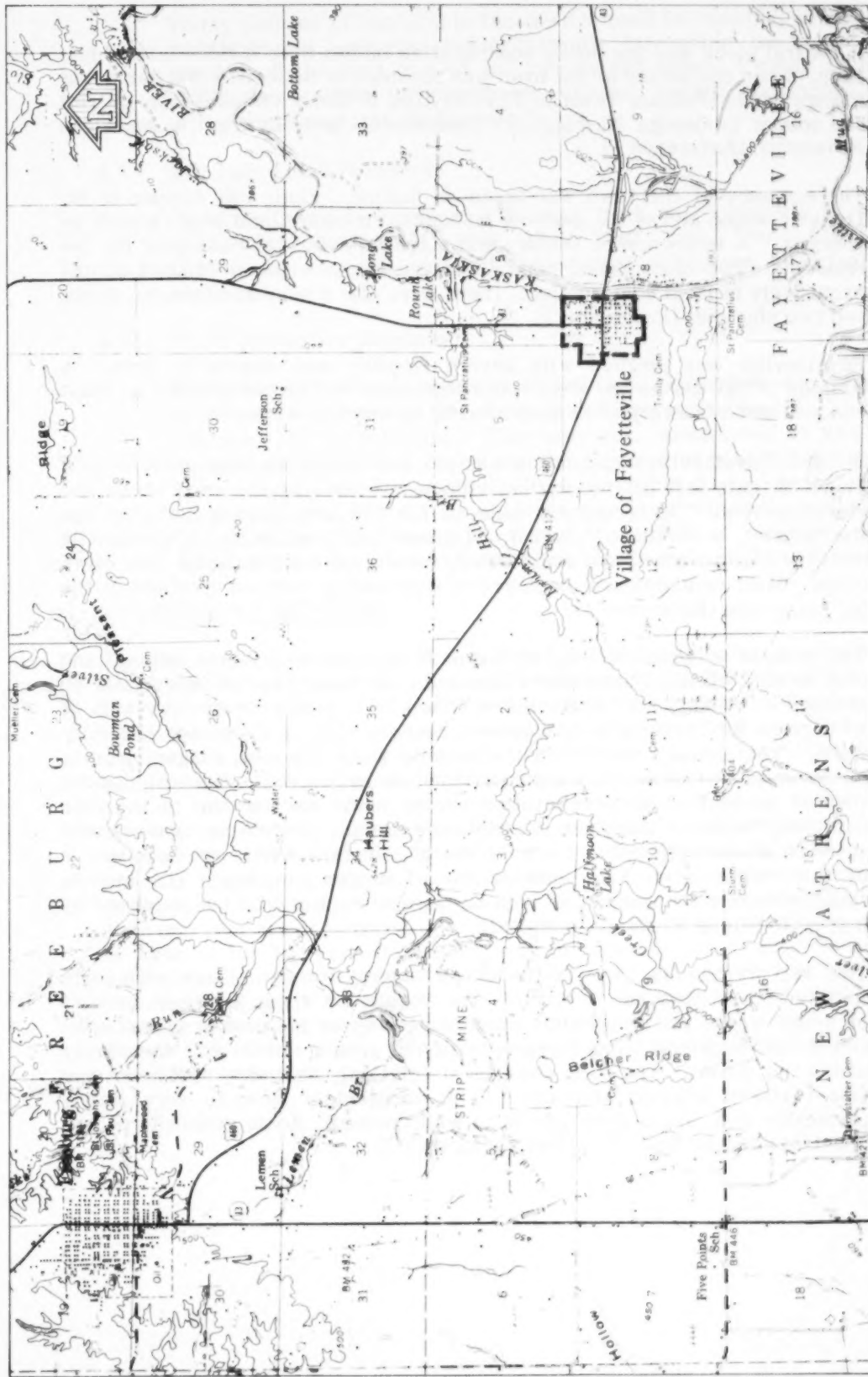
The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction through November 1984. The scope and methods of study were proposed to and agreed upon by the FIA and the Village of Fayetteville.

Flooding caused by overflow from the Kaskaskia River, from the southern corporate limit to the northern corporate limit, was studied in detail.

2.2 Community Description

Fayetteville is located in the southeast portion of St. Clair County, Illinois. Fayetteville is surrounded by the unincorporated areas of St. Clair County. Nearby communities include Mascoutah to the north and St. Libory to the east. Transportation routes throughout the village include Illinois Routes 4 and 15 and Fayetteville is bounded on the east by the Kaskaskia River.

Fayetteville began as Pulliam Town in 1815, consisting of one house and a ferry owned and operated by Thomas Pulliam and his wife, Elizabeth. In 1837, the actual Town of Fayetteville was laid out by Pulliam and Elijah Whiting on the west bank of the Kaskaskia River. It consisted of 28 blocks.



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Federal Insurance Administration

VILLAGE OF FAYETTEVILLE, IL (ST. CLAIR CO.)

APPROXIMATE SCALE



VICINITY MAP

FIGURE 1

A central block was the public square; other blocks were divided into 12 lots each. When the survey of the town was recorded in Belleville, the name was changed from Pulliam Town to Fayetteville, in honor of Lafayette, patriot and soldier in George Washington's Continental Army during the American Revolution (Reference 1).

The economy of the town was based on milling. Flour was shipped to St. Louis by wagon and as far south as Memphis, Vicksburg, and New Orleans by steamer. A wooden shoe factory and a brewery also provided jobs for the residents. Two brickmaking plants provided bricks which were used almost exclusively in local construction. There were also a number of stores, shops, and two churches (Reference 1).

Fayetteville was plagued with severe flooding and disastrous fires. A pontoon bridge across the river was swept away by floodwaters and at least one mill and a brewery were destroyed by fire and then rebuilt.

In 1880, Fayetteville's population was 500 and today the population is 379. There is little left of the original village and none of the early shops and stores survive. The brewery is gone, as are the brickmaking factories and the wooden shoe factory, which outgrew their necessity. Fayetteville consists of a gas station, a small store, several restaurants, and a few other shops. Most residents are employed in surrounding communities and in the St. Louis area (Reference 1).

The climate is characterized by warm to hot summers (June-August) and cool to cold winters (December-February). Air temperatures range from an average minimum of 25 degrees Fahrenheit (F.) to an average maximum of 90 degrees F. Freezing temperatures occur between mid-October and mid-April. The average rainfall in the vicinity is 38.5 inches, ranging from a minimum of 24 inches to a maximum of 58 inches per year. Generally, more than 60 percent of the precipitation occurs in the warmer half of the year (April-September). Summer precipitation usually occurs as convectional showers or thunderstorms of brief duration, whereas winter precipitation is of the frontal type: less intense but of longer duration. The intense thunderstorm may produce an inch or more of rain and be accompanied by hail or damaging winds (Reference 2).

The land surrounding Fayetteville is used mainly for agriculture with some forested areas along the riverbank. The vegetation along the river consists of dense woods and brushlands which give way to residential lawns, open fields, and farmland. The topography of the area is one of flat to slightly undulating plains. The soils consists of relatively thin silty sediments and fine textured (clayey) alluvium. It is moderately slow to very slowly permeable and ranges from poorly to well-drained. Roots generally do not penetrate deeper than three feet (Reference 3).

Thirty percent of the land in the town is used for housing, with a number of mobile homes scattered indiscriminantly throughout the area. Forty-six percent of the land is used for streets and alleys, a result of an original street plan designed for horsedrawn vehicles. Vacant land accounts for most of the remaining land (Reference 1).

2.3 Principal Flood Problems

Fayetteville has experienced flooding from the Kaskaskia River in 1908, 1913, 1915, 1943, 1944, 1946, 1950, 1957, 1961, 1967, 1969, and 1973 (Reference 3). No detailed information for these historical floods is available.

2.4 Flood Protection Measures

Fayetteville does not have any direct flood protection measures. Carlyle Reservoir is located on the Kaskaskia River approximately 71 river miles upstream of Fayetteville. This reservoir, constructed by the COE, was completed in 1967 and serves for the purposes of recreation, flood control, water supply, and navigation. The Kaskaskia River channel between its mouth and the City of Fayetteville has been widened, straightened, and deepened for navigation. The cumulative effect of these two projects has decreased the base flood elevations in Fayetteville about four feet.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for the flooding source studied in detail affecting the community.

All peak discharges were estimated by applying synthetic unit hydrograph methodology to the HEC-1 rainfall-runoff mathematical model developed by the COE (Reference 4). Parameters for Clark unit hydrographs and exponential loss rate functions were determined from regional relationships developed from an optimization study of observed floods at 14 streamflow gages in the vicinity of St. Clair County (Reference 5). Rainfall data provided by the National Weather Service (Reference 6) were used to develop the 10-, 50-, 100-, and 500-year synthetic storm events.

Channel and reservoir routing of the flood hydrographs was performed using the modified Puls method (Reference 4). Reservoir routings were conducted for Carlyle Reservoir.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of the flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
KASKASKIA RIVER					
At Fayetteville	4,542	41,600	61,100	69,800	103,300

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along the flooding source studied in detail.

Channel and valley cross sections of streams studied in detail were obtained by field surveys. All bridges, culverts, and levees along these streams were field surveyed to obtain elevations and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Channel roughness coefficients (Manning's "n") were assigned to portions of the channel and valley based on field inspections, aerial photographs by the Study Contractor, topographic maps, and HEC-2 model calibrations (References 7 and 8). The selected coefficients varied from 0.05 to 0.14 for the overbanks and from 0.035 to 0.07 for the channels.

Starting water-surface elevations were determined at the mouth of the Kaskaskia River using the slope-area method. Water-surface elevations of the 10-, 50-, 100-, and 500-year flood were computed using the HEC-2 computer program developed by the COE (Reference 8). Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using maps developed by photogrammetric methods. Stereophotographic coverage of the community was obtained and the various flood limits were then drawn by the use of a stereoplotting instrument. The mapping was done to a scale of 1:4800, with a four-foot contour interval (Reference 7).

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to

limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. In Illinois, though, under Revised Statutes, Section 65f, Chapter 19 as amended 1973 (Reference 9), encroachment in the flood plain is limited to that which will cause only an insignificant increase in flood heights. Thus, at the recommendation of the Illinois Division of Water Resources, a floodway having no more than a 0.1-foot surcharge has been delineated for this study.

The floodway presented in this study was computed on the basis of equal conveyance reduction from each side of the flood plain. However, when there is insufficient conveyance in one of the overbank areas, the computer program automatically tries to reduce the conveyance on the overbank area to make up the deficit. The results of the computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 0.1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY				BASE FLOOD SURFACE ELEVATION		
CROSS SECTION	DISTANCE ¹	WIDTH ² (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE	
KASKASKIA RIVER A	36.11	4700	23,353	3.0	396.5	396.4	0.1	

¹ MILES ABOVE MOUTH

² THIS WIDTH IS BEYOND CORPORATE LIMITS

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FLOODWAY DATA

KASKASKIA RIVER

TABLE 2

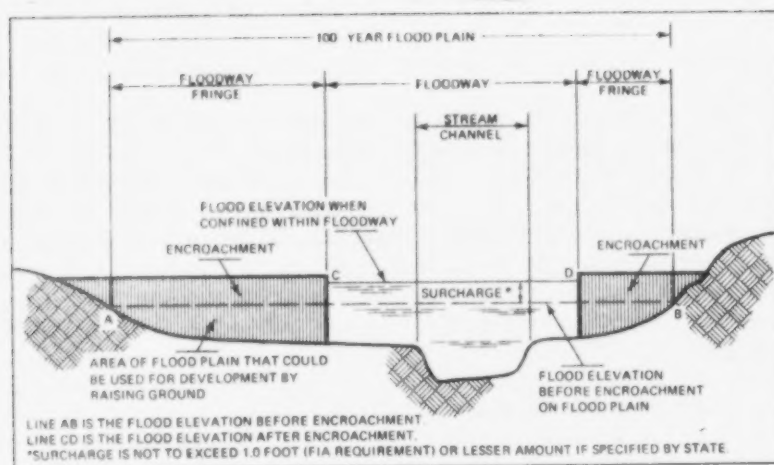


FIGURE 2 - Floodway Schematic

The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the Village of Fayetteville.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

<u>Average Difference Between 10- and 100-year Floods</u>	<u>Variation</u>
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the Village of Fayetteville are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF's are used to set actuarial insurance premium rate tables based on FHF's from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHF's, the entire incorporated area of the Village of Fayetteville was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

- | | |
|-----------|---|
| Zone A13: | Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF. |
| Zone B: | Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided. |
| Zone C: | Areas of minimal flooding. |

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHF's, flood insurance zones, and base flood elevations for the flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Village of Fayetteville is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

A Flood Insurance Study for the unincorporated areas of St. Clair County, Illinois, is in agreement with this study (Reference 10).

A Flood Hazard Boundary Map has been published by the Federal Insurance Administration (Reference 11). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, One North Dearborn Street, Chicago, Illinois 60602.

FLOODING SOURCE	PANEL ¹	ELEVATION DIFFERENCE ² BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION ³ (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
KASKASKIA RIVER REACH 1	0001	-6.5	-2.5	4.1	065	A13	VARIES—SEE MAP

¹FLOOD INSURANCE RATE MAP PANEL

²WEIGHTED AVERAGE

³ROUNDED TO NEAREST FOOT

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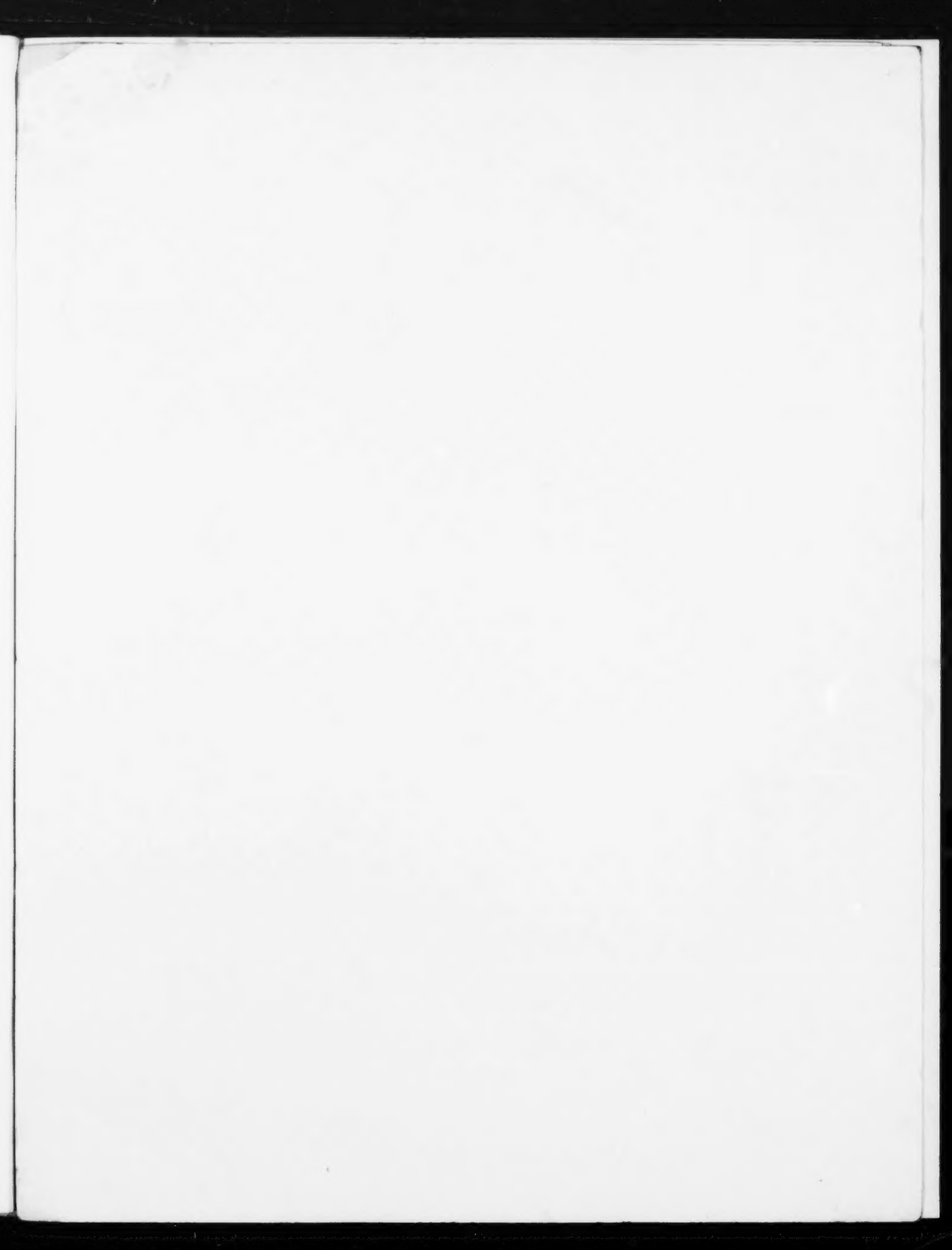
FLOOD INSURANCE ZONE DATA

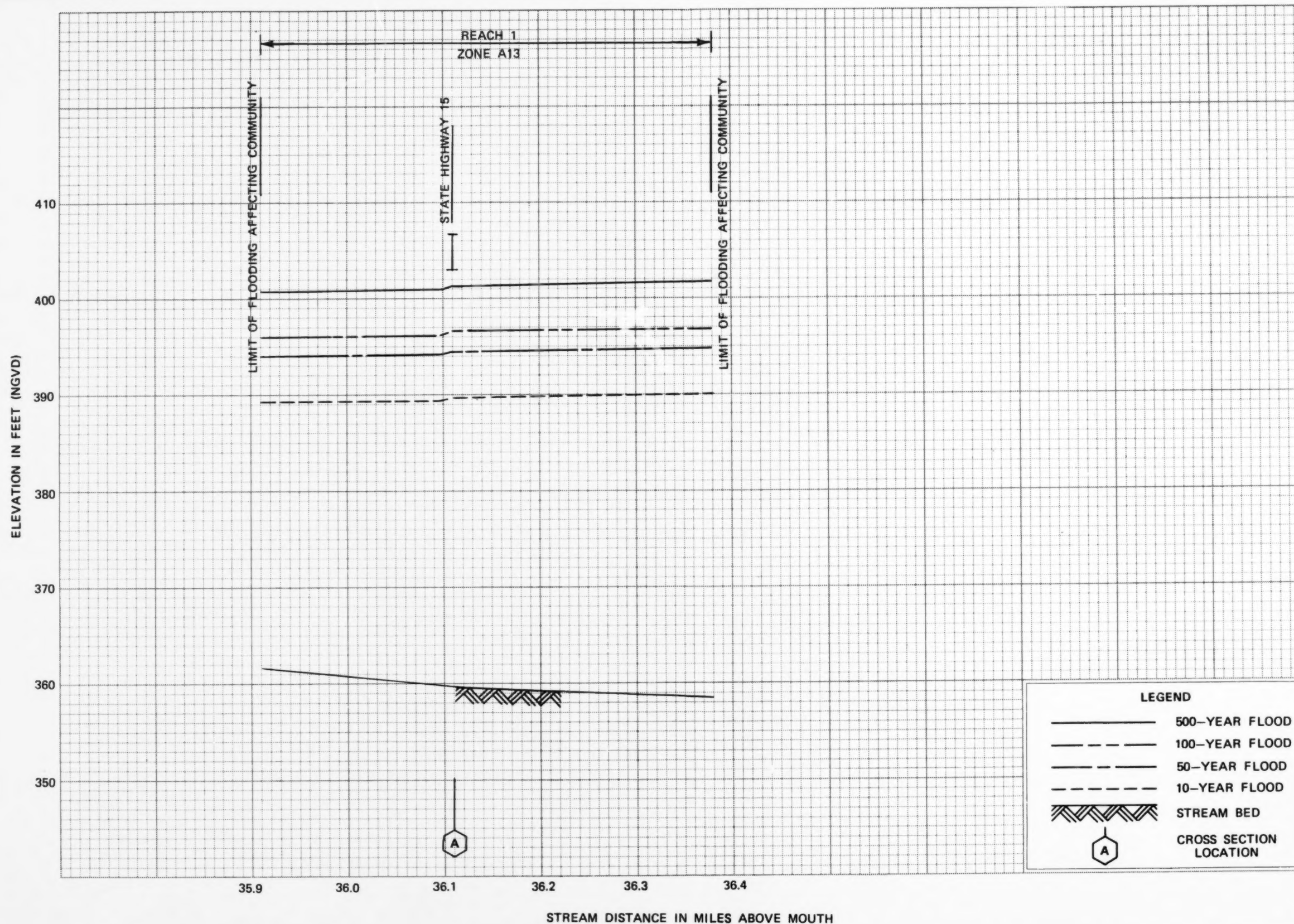
KASKASKIA RIVER

TABLE 3

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FLOOD PROFILES

KASKASKIA RIVER

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VILLAGE OF FAYETTEVILLE, IL
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